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Midwest Engineer

SERVING THE ENGINEERING PROFESSION

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DETROIT

**CENTENNIAL
OF
ENGINEERING
1852 - 1952**



LOCATION OF INDUSTRIES
IN CHICAGO AND NORTHERN ILLINOIS—PAGE TWO

Vol. 5

JULY, 1952

No. 2



GREEN ORE SINTERING PLANT
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BLACKWELL, OKLAHOMA
AMERICAN ORE RECLAMATION CO. - ENGINEERS

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Serving the Engineering Profession



JULY, 1952

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Cover Story

The CENTENNIAL OF ENGINEERING celebrates the 100th anniversary of the American Society of Civil Engineers. The purpose of the Centennial is to acquaint the public with the part played by the engineer in the development of the greatest nation in the world.

Location of Industries in Chicago and Northern Illinois

By *Norman E. Brown*
Public Service Co.
of Northern Illinois

The growth and prosperity of a majority of our great cities, and their pre-eminence in the world of business and commerce has been closely identified with industrial development. Hundreds of smaller communities and areas likewise recognize and acknowledge the vital and dominant part industry has filled in their inception, growth and present well being. Consequently, the extent and nature of industrial development, especially the development achieved through the location and relocation of industries, is of first interest and concern to communities and their citizens.

The reasons communities or areas desire more factories, more industrial growth, are obvious. It is believed that factories bring increased job opportunities and payrolls. Real estate values may be increased. The tax base may be broadened and additional tax revenues obtained for such things as schools, streets, parks and other community facilities. Merchants and professional men will prosper, young people will be encouraged to establish themselves in their home town; in short, the entire community is expected to benefit from industrial activity.

This interest is especially keen in Chicago and Northern Illinois, one of the leading industrial centers of the nation and capital of an inland empire extending 500 miles in all directions from the lower tip of Lake Michigan.

A review and analysis of industrial development in the Chicago and Northern Illinois area attributable to manufacturing industries which arranged to locate in the area during the years 1945 to 1950 inclusive has produced significant

data about area industrial development. This 11,000 square mile area consists of all or parts of the 32 counties which comprise approximately the northern one-third of the State of Illinois. Within its boundaries are 535 communities, including the City of Chicago.

Data developed includes facts about plant location trends, the number of industries which arranged to locate, their origins and the communities selected. Also determined are the types of manufacturing operations represented, employment afforded, and the land and building requirements of new and relocated industries.

An industry is defined as a manufacturing enterprise employing ten or more workers. For analysis purposes industries have been classified into four origin groups:

1. Newly Organized Firms
2. New Branch Plants of Established Firms
3. Industries Moving Into the Area
4. Relocations Within the Area

Industries in the first three groups, individually and collectively, are referred to as "new" since they constitute activities entirely new to the area. The fourth grouping refers to firms already operating in the area which arranged to shift about or "relocate" within the area, usually to obtain larger, more modern facilities.

During the six years, 1945 to 1950 inclusive, 84 newly organized firms, new branch plants, and firms moving in from other areas made arrangements to locate in Chicago and Northern Illinois. An additional 311 firms presently located and operating in the area arranged to relocate within the area.

General business and economic conditions influence industries' plans for new or relocated facilities. These post-war years have been characterized by a generally sustained high level of business activity, but as they passed by, seemed to give an impression of wide and rapid fluctuations. This feeling is reflected in the number of industries which arranged to locate in each of the six years. It appears that industry location, which ranged from 101 in 1939 to 250 in 1946, tended to follow these psychological reactions to a greater extent than they followed some of the commonly used business indices.

The origin of industries has been the subject of much study and conjecture. Origin in this instance refers to "parentage" or "ancestry" rather than previous geographical location. Usually such studies have been made to analyze the industrial growth, or the lack of it, in a community or area, and to aid in planning and promotional efforts pointed toward securing new industries.

Origins of the 684 new industries and 311 relocated firms, were determined at the time their arrangements were made to locate.

Numerically, newly organized firms represent 36.8 per cent of all industry locations. These are completely new organizations formed specifically to engage in a particular activity. Often they are formed by local citizens, financed locally and established near the residences of the principals. Initially they are usually smaller projects, but many develop into very large operations.

New branch plants of established firms, often considered the most desirable and stable form of industrial growth,

Number of Industries Which Arranged to Locate			
Year	Number of New Industries	Number of Relocated Industries	Total Number of Industries Which Arranged to Locate
1945	76	42	118
1946	178	72	250
1947	158	58	216
1948	105	38	143
1949	71	30	101
1950	96	71	167
Totals	684	311	995

Origins of Industries Which Arranged To Locate in Chicago and Northern Illinois (1945-1950 Inclusive)			
Origins	Number	Per cent of New Industries	Per cent of all Industries
Newly Organized	366	53.6	36.8
New Branch Plants	291	42.5	29.3
Moved Into Area	27	3.9	2.7
Total New Industries	684	100.0	68.8
Relocation Within the Area	311		31.2
Grand Totals	995		

constituted 29.3 per cent of the industries arranging to locate. These industries are usually established only after careful study to meet some specific need, are operated by experienced personnel, financed by the parent organization, and get into satisfactory operation quickly.

Only 27 industries, or 2.7 per cent of the total moved in from locations in other parts of the country. This tends to refute a prevalent impression that most new industrial growth results from the physical relocation or moving of industries from one area to another. Original locations of these 27 firms are pictured in Figure 1.

Intra-area relocations of industries totalled 311 or 31.2 per cent of all industries which arranged to locate. Of these, 294 moved from within Chicago to new suburban and outlying locations, eleven which formerly operated in the suburbs relocated in Chicago, and six moved from one suburban community to another.

The 684 new and 311 relocated industries selected 186 different communities among the 535 in the Chicago and Northern Illinois area. New industries located quite generally throughout the area, with the expected concentration near to Chicago. Intra-area relocations were most numerous in suburban communities adjacent to or within 50 miles of Chicago. The largest concentrations of all industries numerically were in Chicago (165), Franklin Park (52), Skokie (42), Cicero (34), and Aurora (33).

A summary of industrial locations by counties shows that industries arranged to locate in 25 of the 32 counties in the area studied. Leading numerically were Cook (618), Kane (63), Lake (52), DuPage (51), and Will (43) counties. All are in the Chicago Metropolitan Area.

Acceleration of the trend toward smaller communities was noticeable. More than half or 52.4 per cent of all the 995 industries studied selected communities with populations of less than 10,

000. About 30.9 per cent chose communities of 10,000 to 100,000 population. It should be recognized, however, that some of the smaller communities selected are surrounded by other communities and are in areas which have most of the characteristics of a large city except a single corporate limit. Numerically 16.7 per cent of the firms arranged for facilities in Chicago, the only city of over 100,000 in the area.

During the early years of the period studied the factors of dispersion and strategic relocation, as related to military security or defense production, were not major items entering into the location studies of many of the firms locating. In 1950, however, these factors began to receive more frequent consideration, and were assigned greater weight.

One of the greatest single characteristics of the Chicago area is its diversity rather than pre-eminence of a single kind of manufacture, trade, or service. Figure 2 presents graphically the manufacturing activity patterns in ten leading industrial areas in the United States.

Types of manufacturing activities carried on by the 995 firms which located or relocated can be classified into nineteen of the 20 major industry groups established by the United States Census Bureau. Thus the characteristic diversi-

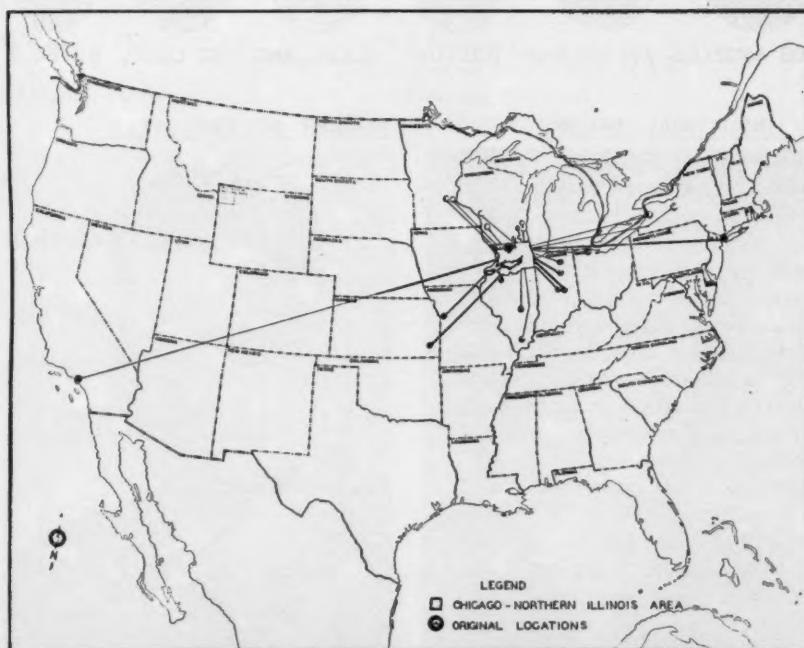


FIGURE 1. ORIGINAL LOCATIONS OF INDUSTRIES MOVING INTO AREA

ty of manufacturing activities in Chicago and Northern Illinois is being maintained by industrial firms arranging to locate in the area. Most numerous among the new and relocated industries were producers of Fabricated Metal Products (251), Electrical Machinery (122), Chemicals and Allied Products (89), and Machinery, Except Electrical (89). Smallest number of new firms were engaged in manufacture of Leather and Leather Products (4) and Rubber Products (8).

Employment—additional jobs or work opportunities—is one of the principal

contributions of industry to an area. Presently, about four of every ten workers in the Chicago area are employed in manufacturing; two in wholesale and retail trade; one in personal or business services; one in transportation and public utilities; and two in finance, construction, government and other activities. The 684 new industries are expected to provide jobs for 103,490 workers. Since none of these firms were previously operating in the area, this represents the net additional jobs to be created directly by these new industrial activities.

An additional 27,210 workers were expected to be employed in the relocated industries at their new locations. These represent net additional employees only to the extent that the relocated operations were larger than those carried on at the original locations. However, these activities did result in some geographical redistribution of this number of jobs.

A study of the distribution of expected employment indicates that 90.9 per cent of the 130,700 total workers in new and relocated industries were to be employed in the counties of Cook, DuPage, Kane, Lake and Will. These counties constitute the Illinois portion of the Chicago Industrial Area, as defined by the United States Department of Commerce.

The most visible and tangible evidence of the presence of manufacturing industries is their factory buildings. Today's concept of a factory covers the entire range from the old multi-story red brick building with a smoke stack, located along a stream from which water or power was obtained, to the modern one-story brick, glass and steel structure which looks more like a school or public building.

Industrialists have come to realize the importance of facilities which are both efficient and attractive, because expanding industry has a problem. In many areas industry has utilized a large part of the land presently available and designated for industrial use. Therefore, factory facilities must be established in areas not heretofore industrialized. Attractive factory buildings, designed and located with careful consideration to their relationship to the immediate and nearby areas, are one of the most effective means by which industries can promote the satisfactory and amicable solution of their expansion needs.

Forty-three per cent or 430 of the 995 new and relocated industries arranged to purchase vacant industrial land and planned to construct new factory buildings designed to meet their individual needs. The gross land acquisition was some 8,805 acres, and the net land area used for "normal" manufacturing operations, excluding large acreages for a government laboratory and several coal mines and gravel pits, was 4,109 acres. Thus the land acquired averaged 9.7 acres for each of the 430 firms. Twenty-one of them purchased a total of 99.8

(Continued on Page 12)

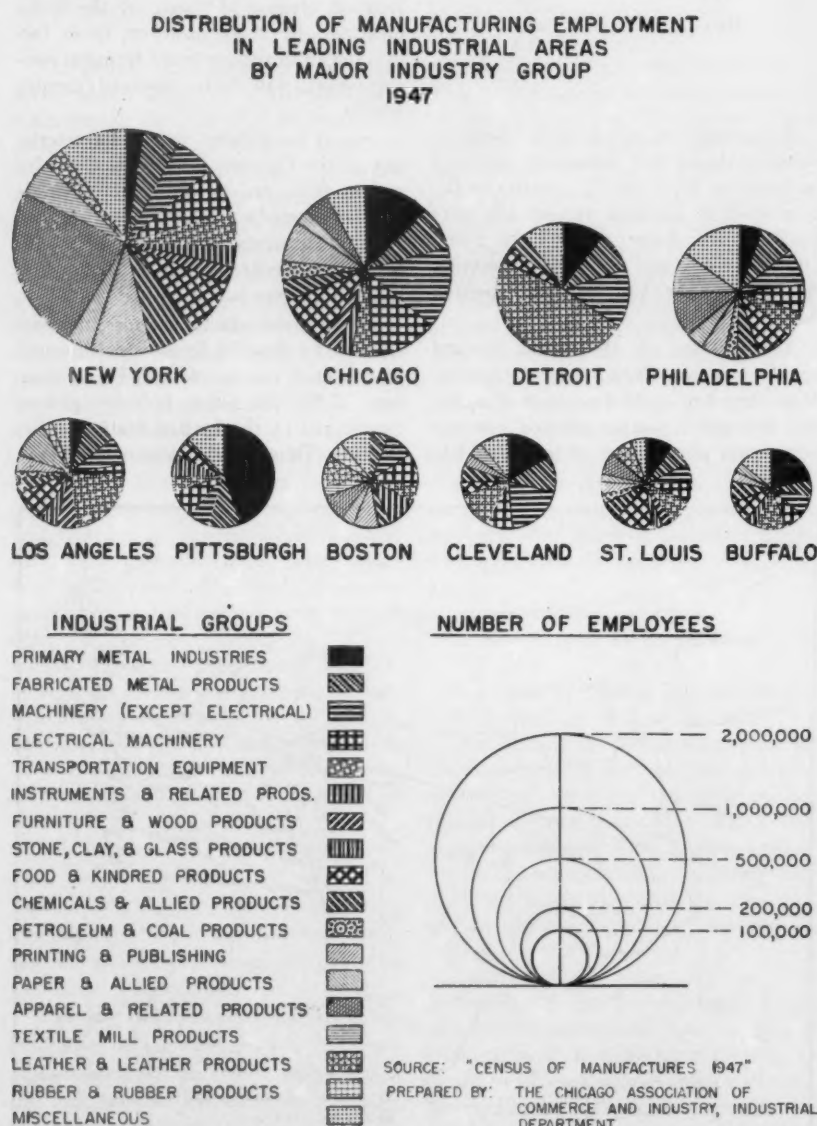


FIGURE 2

Centennial Program

SECTION I — THE ROLE OF THE ORGANIZED PROFESSION — Wednesday, September 3 — Eighth Street Theater

Chairman—Harry S. Rogers, President,
Polytechnic Institute of Brooklyn

1. Background and Development of the American Society of Civil Engineers
James K. Finch, Dean Emeritus,
School of Engineering, Columbia University
2. Part Played by Military Engineers
Colonel M. Heiberg
Member of the Faculty at West Point
3. Growth of the American Institute of Mining and Metallurgical Engineers
A. B. Parsons, Consulting Engineer
4. Advancements Made by the American Society of Mechanical Engineers
George A. Stetson, Editor
Mechanical Engineering
5. Evolution of the American Institute of Electrical Engineers
M. B. Hooven, Electrical Engineer,
Electric Engineering Department,
Public Service Electric and Gas Company
6. The Story of the American Institute of Chemical Engineers
Sidney D. Kirkpatrick, Editorial Director,
Chemical Engineering—Chemical Week
7. The Inter-Society Role
Harry S. Rogers, President,
Polytechnic Institute of Brooklyn

SECTION II — EDUCATION AND TRAINING — Thursday, September 4 — 8th Street Theater

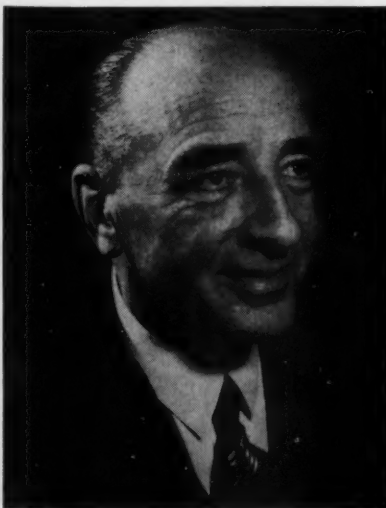
Chairman—A. A. Potter, Dean of Engineering, Purdue University

1. History of Engineering Education
Frederic T. Mavis, Head, Department of Civil Engineering, Carnegie Institute of Technology
2. Achievement to Date in Engineering Education
Thorndike Saville, Dean, College of Engineering, New York University
3. The Technical Institute: Its Relation to Engineering and to Trade Training
C. W. Beese, Dean, Division of Technical Extension, Purdue University
4. The Engineer and the Scientist
W. F. G. Swann, Director, Bartol Research Foundation of Franklin Institute, Swarthmore, Pennsylvania
5. Looking Ahead for Engineering Education
S. C. Hollister, Dean of Engineering, Cornell University
L. M. K. Boelter, Chairman, Department of Engineering, University of California

SECTION III — FOOD — Friday, September 5 — Palmer House Ballroom

Chairman—Clarence Francis, Chairman of Board,
General Foods Corporation

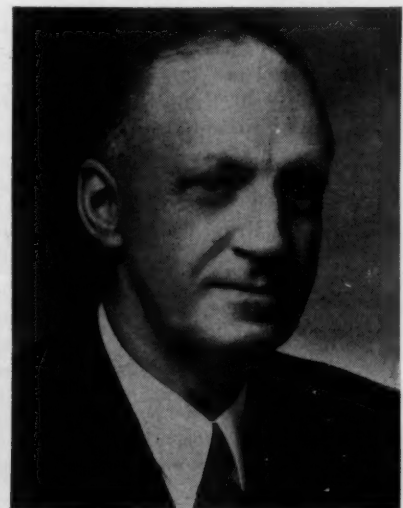
1. Balanced Use of the Land
Fairfield Osborn, President
Conservation Foundation
2. Technological Development of Farming
John L. McCaffrey, President
International Harvester Company
3. Technology of Processing
John Holmes, President
Swift & Company
4. Distribution of the Products of Farming
Ned Fleming, President,
Fleming Company, Inc.



Lenox R. Lohr, President



Frank Edwards, General Manager



E. L. Chandler, Convocation Manager

5. Nutrition for Humans and Animals
Charles G. King, President,
The Nutrition Foundation, Inc.
6. The Role of the Farmer
Wheeler McMillen, Editor,
The Farm Journal

SECTION IV—TOOLS—Friday, September 5—Eighth Street Theater

- Chairman—Kenneth H. Condit, Dean, School of Engineering, Princeton University
Vice-Chairman—H. L. Tigges, Executive Vice President, Baker Brothers, Incorporated
1. Historical Background
Kenneth H. Condit, Dean, School of Engineering, Princeton University
 2. Small Tools
Carl J. Oxford, Chief Engineer,
National Twist Drill and Tool Company
 3. Machine Tools
Swan E. Bergstrom, Vice President, National Machine Tool Builders Association and Vice President, Cincinnati Milling Machine Company
 4. Measuring Instruments and Tools
Louis Polk, President,
The Sheffield Corporation
 5. Tool Engineering
Leslie B. Bellamy, President,
American Society of Tool Engineers
 6. The Next Century
The Honorable Ralph E. Flanders, United States Senator from Vermont.

SECTION V—TRANSPORTATION—Monday and Tuesday, September 8 and 9—Conrad Hilton Ballroom

Chairman—Charles F. Kettering, Research Consultant,
General Motors Corporation

1. Automobiles
Christy Borth,
Automobile Manufacturers Association
2. Ships
Admiral Harold G. Bowen, Executive Director,
Thomas Alva Edison Foundation, Inc.
3. Trailers
V. M. Drew, Director of Research,
Fruehauf Trailer Company
4. Aircraft
O. T. Kreusser,
Allison Division of General Motors
5. The Growth and Status of Highway Transport
B. B. Bachman, Vice President,
Autocar Company
6. Railroads
Fred G. Gurley, President,
Atchison, Topeka and Santa Fe Railroad
7. Buses
Leon F. Banigan, Editor,
Bus Transportation
8. Farm Tractors (To be announced)
9. Air Frame
C. S. (Casey) Jones, President,

Academy of Aeronautics,
LaGuardia Airport

SECTION VI—MINERAL INDUSTRIES—Monday and Tuesday, September 8 and 9—Hotel Sherman Ballroom

Chairman—Clyde Williams, Director,
Battelle Memorial Institute
Secretary—Richard J. Anderson, Assistant Supervisor
Battelle Memorial Institute

1. Introduction
Chairman
2. Exploration for Metals, Petroleum and Water
William E. Wrather, Director,
United States Geological Survey
3. Mining and Quarrying
Donald H. McLaughlin, President,
Homestake Mining Company
4. Coal-Mining, Preparation, and Utilization
J. B. Morrow, Consulting Mining Engineer,
Alford, Morrow and Associates
5. Ore Beneficiation and Hydrometallurgy
O. C. Ralston, Chief Metallurgist,
United States Bureau of Mines
6. Nonmetallic Materials
John D. Sullivan, Assistant Director,
Battelle Memorial Institute
7. Iron and Steel Production and the Coke Industry
Walther Mathesius, Consultant,
Freyn Engineering Division,
Koppers Company, Inc.
8. Nonferrous Smelting and Refining
R. W. Diamond, President,
Consolidated Mining and Smelting Company
of Canada, Ltd.
9. Synergism of Engineering and Petroleum
Robert E. Wilson, Chairman of the Board,
Standard Oil Company (Indiana)
10. The Role of Metals in our Economy
Zay Jeffries, Vice President,
General Electric Company
11. Commentary
Clyde Williams

SECTION VII—STRUCTURES AND CONSTRUCTION—Monday, September 8—Eighth Street Theater

Chairman—Waldo G. Bowman, Editor,
Engineering News-Record

1. What Construction Means to America
Willard Chevalier, Executive Vice President,
McGraw-Hill Publishing Company
2. How Man Has Developed Buildings to Serve His Every Need
John O. Merrill,
Skidmore, Owings & Merrill, Architects
3. How Dams Have Become Man's Vital Servant for Food, Water Power and Protection from Floods
Gail A. Hathaway,
Special Assistant to Chief of Engineers,
U. S. Army, and former U. S. Chairman,
International Commission on Large Dams
4. How Bridges Have Increased Man's Mobility
David B. Steinman, Consulting Engineer
5. How Science Was Applied to Design, Increasing

Man's Control Over Safety and Economy

Linton E. Grinter, Dean, Graduate School and
Director of Research, University of Florida

6. How New Materials Increased Man's Building Ability

Walter C. Voss, Head, Department of
Building, Engineering and Construction,
Massachusetts Institute of Technology

7. How Mechanization Brought Speed and Economy to Construction and Created a Great Industry

Harold W. Richardson, Editor,
Construction Methods and Equipment

SECTION VIII—CHEMICAL INDUSTRIES—Tuesday,
September 9—Eighth Street Theater

Chairman—Francis J. Curtis, Vice President,
Monsanto Chemical Company

1. Introduction—Chairman

2. Definition—Importance of Chemical Industries
Sidney D. Kirkpatrick, Editorial Director,
Chemical Engineering—Chemical Week

3. Chemical Engineering—A New Science
Warren K. Lewis,

Professor of Chemical Engineering,
Massachusetts Institute of Technology

4. Industrial Chemicals—Inorganic

William T. Nichols, Vice President,
American Institute of Chemical Engineers

5. Industrial Chemicals—Organic

H. E. Thompson, Vice President,
Union Carbide & Carbon Corporation

6. Drugs and Medicines

Randolph T. Major, Vice President,
Merck & Company, Inc.

7. Petroleum

Eger V. Murphree, President,
Standard Oil Development Company

8. Plastics

Frank C. McGrew, Assistant Research Director,
E. I. duPont de Nemours & Co., Inc.

9. Fibers

J. B. Quig, Manager, Textile Research Division,
E. I. duPont de Nemours & Co., Inc.

SECTION IX—COMMUNICATIONS—Thursday and Friday,
September 11 and 12—Eighth Street Theater

Chairman—W. H. Harrison, President,
International Telephone & Telegraph Company

Vice-Chairman—L. A. DuBridge, President,
California Institute of Technology

1. Telephony

H. S. Dumas, Executive Vice President,
American Telephone and Telegraph Corporation.

2. Telegraphy

H. P. Gorwith, Vice President in Charge of
Development & Research,
The Western Union Telegraph Company

3. Radio

W. L. Everitt, Dean, College of Engineering,
University of Illinois

4. Television

E. W. Engstrom, Vice President,
Radio Corporation of America

5. Radar Pays Dividends

L. A. DuBridge, President,
California Institute of Technology

6. Printing

John J. Deviny
Public Printer of the United States

7. Motion Pictures

Paul Raibourn, Vice President,
Paramount Pictures Corporation

8. Illumination

Willard C. Brown, Manager of Application
Engineering, General Electric Company

9. Communication and the Future

J. W. McRae, Vice President,
Bell Telephone Laboratories, Inc.

10. Lay Commentary

(To be announced)

SECTION X—ENERGY—Thursday and Friday, September
11 and 12—Conrad Hilton Hotel

Chairman—Eugene Ayres, Technical Assistant to Executive Vice President, Gulf Research and Development Company

1. Brief introduction by Chairman

2. Demands for Energy

Richard J. Lund, Supervisor,
Engineering Economics Division,
Battelle Memorial Institute

3. Coal Reserves—A Matter of Economics

Harold J. Rose,
Vice President and Director of Research,
Bituminous Coal Research, Inc.

4. Availability of Oil Products

E. V. Murphree, President,
Standard Oil Development Company

5. Supply of Water Power in the United States

F. M. Gunby, Associate and a Director,
Chas. T. Main, Inc.

6. Steam and Electric Power—Its Past and Future

Theodore Baumeister,
Stevens Professor of Mechanical Engineering,
Columbia University

7. District Steam Heating

By the following past Presidents of National District Heating Association: Ernest E. Dubry, Robert L. Fitzgerald, William A. Herr, Robert D. Martin, Leonard S. Phillips, J. Earl Seiter, Glen D. Winans; presented by A. R. Munford, Research Department, Combustion Engineering-Superheating, Inc.

8. Warmth for Comfort

Maria Telkes, Research Associate
Massachusetts Institute of Technology

9. Conservation in Production of Oil and Gas

William J. Murray, Jr., Commissioner,
Railroad Commission of Texas

10. Commentary

Eugene Ayres, Technical Assistant to the
(Continued on Page 11)

Rules of the Board of Direction

RULE 1. Members of all grades shall be eligible to membership in the Sections of the Society, and shall be enrolled in the respective sections upon application to the Secretary. All members enrolled in a Section shall have the right to vote in that Section. A member may be enrolled in one or more Sections dependent upon the field or fields of engineering in which he is engaged or interested.

RULE 2. The management of each Section shall be vested in an Executive Committee, consisting of six Directors who shall serve three years, two of whom shall be elected each year, except that, at the first regular election of a new section, six Directors shall be elected, two of whom shall serve for one year, two for two years and two for three years or until their successors are elected and take office.

RULE 3. Each Executive Committee shall direct the affairs of its respective Section. It shall provide the program and arrange all details for the meetings assigned and approved by the Program Committee. It shall cooperate with the other committees of the Society in serving the best interests of the Society and the profession. No later than fifteen days after the last technical meeting of a Section during an administrative year, it shall submit to the Program Committee an annual report which shall include a complete descriptive and statistical record of all meetings sponsored by the Section during the administrative year, together with any recommendations or suggestions which it believes will improve the technical program of the Society.

RULE 4. The Executive Committee of each Section shall appoint, in January, a Nominating Committee from the membership of that Section to consist of five members, only one of whom shall

be a member of the Executive Committee.

RULE 5. The Nominating Committee shall nominate two eligible Corporate Members for the Executive Committee of that Section, and shall secure the acceptance of each nominee before reporting to its Executive Committee.

RULE 6. Other Corporate Members may be nominated by petition signed by ten Corporate Members of the section, provided such petition is posted on the bulletin board in the Society rooms at least two weeks prior to the election, and provided the acceptance of these nominees has been secured in writing.

RULE 7. The Directors shall be elected by ballot, or if there are no nominations by petition, by voice vote at the last regular meeting of the section during each administrative year. This ballot or vote shall be restricted to members of the section. Ten members of the section shall constitute a quorum at this election.

RULE 8. The Executive Committee shall meet following the election of Directors and prior to the annual meeting of the Society and elect from its membership a Chairman, a Vice Chairman,

a member of the Program Committee, a member of the Publications Committee, a member of the Attendance Committee and a member of the Membership Committee, each of whom shall serve for one year or until his successor is elected and takes office. The Chairman shall have served during the previous year as a member of the Executive Committee.

RULE 9. The Secretary of the Society shall be ex-officio Secretary of all Sections.

RULE 10. The Executive Committee shall meet at the call of the Chairman or Vice Chairman of the Section, or of any two members thereof. Three members shall constitute a quorum.

RULE 11. Vacancies in the Executive Committee of any Section shall be filled for the remainder of the unexpired term by the Executive Committee.

RULE 12. The Chairman of a section shall preside at all meetings of that section and of its Executive Committee. The Vice Chairman shall perform the duties of the Chairman in his absence.

RULE 13. Each Section shall hold each year such meetings as assigned and approved by the Program Committee.

RULE 14. A Section shall not incur any indebtedness or commit the Society financially, without the approval of the Board of Direction.

RULE 15. These rules may be amended by a majority vote of the members of the Board of Direction at any regular meeting of the Board or at a special meeting called for that purpose. Approved by the Board of Direction, May 27, 1940.

Amended, August 24, 1942

Amended, February 26, 1945

Copied, February 20, 1952

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Navy's Civil Engineers Exhibit

Scale models of the latest designs for prefabricated atomic bomb shelters, and of a new turbojet laboratory, are features of the Navy's Civil Engineering Corps exhibit at the Museum of Science and Industry in Chicago.

The exhibit, on the east mezzanine at the museum, is a part of the Centennial of Engineering being celebrated in Chicago this year.

There are 11 displays in the Navy's engineering exhibit. They will be at the museum for one year.

The protective shelters display illustrates the theory of the Navy's new pre-cast concrete blast-resistant structures, the result of years of research. The Navy believes that the new design, featuring a "beehive" construction which provides maximum strength at a minimum of cost, provides the best answer to the problem of creating economical, easily-built structures which can withstand nearby atomic blasts.

Biggest display is a transparent plastic model of the workings of a Navy turbojet testing laboratory. The model measures 6 by 16 feet.

Another major display illustrates, in a circular scale model of typical Navy structures, the wide variety of CEC construction work.

The Corps, responsible for the design, construction and repair of the Navy's shore establishment, designs every type of facility that would be required by a large city, plus specialized structures to provide for strictly military needs. The display shows models of shops, foundries, bridges, docks, harbors, office buildings, power stations and laboratories.

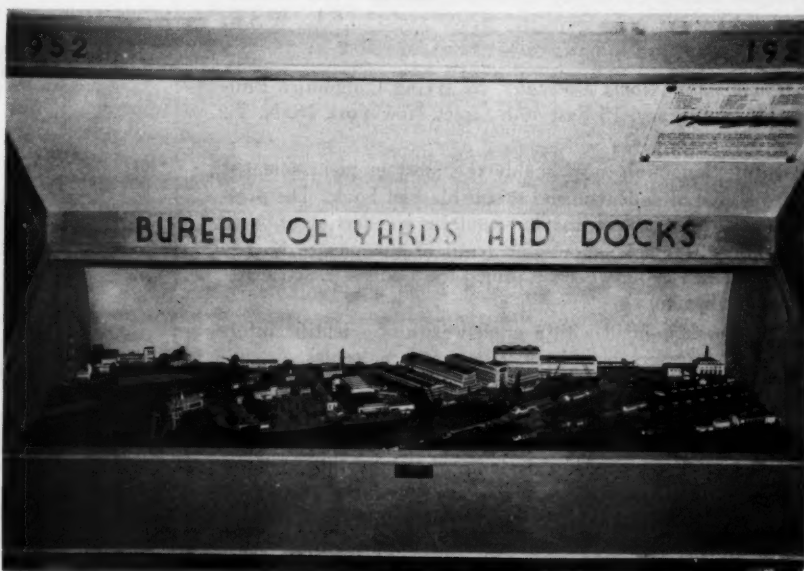
A dual display illustrates the advances in Navy yard design over the 100 years covered by the Centennial of Engineering. One model shows how a Navy yard would have looked in 1852. The other shows the same yard in 1952.

(Continued on Page 15)

MIDWEST ENGINEER



A PREFABRICATED ATOMIC BOMB SHELTER is one of the scale models on display in the Navy's Civil Engineering Corps exhibit at Chicago's Museum of Science and Industry. The display shows the Navy's new shelter design, which provides for economical, easy-to-build structures of pre-cast concrete that resist atomic blasts. LTJG H. P. Cahill, Great Lakes, points to a sample of the "beehive" construction which gives the structures their great strength. The exhibit is a part of Chicago's Centennial of Engineering observance. (U. S. Navy photo)



ADVANCEMENTS IN NAVY YARD DESIGN are illustrated by this scale model of a modern Navy yard in the Navy's Civil Engineering Corps exhibit at Chicago's Museum of Science and Industry. A companion model shows how the same yard would have looked 100 years ago. The exhibit is a part of Chicago's Centennial of Engineering observance. (U. S. Navy photo).

Reviews of Technical Books

Available at WSE Headquarters

Specifications and Costs, Data Book for Civil Engineers, Volume II, by Elwyn E. Seelye, John Wiley and Sons, Inc., New York, N. Y. Second edition, 1951. 560 pages. \$13.00.

This reference book stands out for clarity of writing, organization of subject matter, and excellence of typography. The original edition was so well received upon its publication in 1946 that new material was added to increase its usefulness. Nicely-bound in gold embossed gray cloth, it is handsome as well as a serviceable addition to a construction library.

This book includes up-to-date specifications and contracts for nearly every type of building and heavy construction, with forms ranging from standard invitations and proposals to instructions for cleaning up the site.

It is the only book to give cost figures for all the labor, materials and other factors involved in construction. These figures are tied to the *Engineering News-Record Cost Index*, which means that they can be brought up to the minute by a simple calculation. Many additional costs are given in convenient tabular form.

Costs are given for ski-tows, tunnels and drive-in theatres, swimming pools and athletic fields—to name a few unusual subjects. Costs are also given for standard types of construction.

An unusually complete glossary, in which the entries are grouped according to subject matter, concludes this volume.
J.C.L., W.S.E.

Phenomena Atoms Molecules, by Irving Langmuir. Philosophical Library, 15 East 40th Street, New York 16, N. Y., 436 pages. \$10.00.

Irving Langmuir is probably the most eminent scientist in this field of endeavor and this is his first book. The present volume of eighteen chapters contains a collection of twenty papers which is about one tenth of the papers he has written since 1909, when he joined the General Electric Research laboratory.

This book is filled with a great wealth of scientific information on surface chemistry, atoms and molecules.

His first three chapters on Science, Common Sense and Decency, Discussion of Science Legislation and World Control of Atomic Energy, should be interesting to anyone regardless of his profession. It is suspected by this reviewer however, that Dr. Langmuir has attributed far greater integrity to Russia than it is capable of exhibiting under its present government, and had the author written these chapters at the present time the tone might be different. The last fifteen chapters are devoted to the field of science in which Dr. Langmuir is known the world over for his outstanding work.

H.J.McC., W.S.E.

Numerical Methods in Engineering, by Mario G. Salvadori and Melvin L. Baron, Prentice-Hall, Inc., New York, N. Y. First edition, 1952. 258 pages.

This book is addressed to students of engineering, physics, chemistry, mathematics, and to any individual desiring to become acquainted with numerical methods in order to apply them to his professional work. It is assumed that the reader has a knowledge of the calculus and a smattering of differential equations.

Approximation methods based on series expansions or on purely numerical considerations for the solution of initial value and boundary value problems, are well adapted to the slide-rule use and to use on desk electric calculators.

Technical problems, for which an analytical solution is unobtainable, become more numerous and more complex daily, while technical personnel capable of working out complex analytical problem is scarce. The numerical approach permits the use of workers with a limited knowledge of mathematics.

The five chapters of the book deal with: 1-Algebraic equations. 2-Finite difference applications to numerical differentiation, integration, interpolation, and extrapolation. 3-Initial value problems. 4-Boundary problems. 5-Partial differential equations.

The numerical techniques are introduced by simple illustrative problems taken from various fields of engineering as are many of the numerical problems at the end of each chapter and can be interpreted analogically in a variety of ways. But the reader does not need to be familiar with the particular field of knowledge involved in the illustrative problem to grasp the meaning of the numerical technique.

It is amply indexed.

H.P.H., W.S.E.

WSE Program Sept. 4

MORNING

10:00 AM WSE AUDITORIUM

Welcome

Dean Ovid W. Eshbach, President, Western Society of Engineers: Dean of Engineering, Northwestern University Technological Institute, Evanston, Ill.

Panel

The Contribution of Engineers to the Community Moderator

Dr. Gustav Egloff, Director of Research, Universal Oil Products Co., Chgo, Ill.

10:15 AM Bridges

Donald N. Becker, Chief Structural Engineer, A. J. Boynton and Co., Chgo, Ill.

10:40 AM Transportation

Virgil E. Gunlock, Commissioner of Subways and Highways, Chgo, Illinois

11:05 AM Water

L. R. Howson, Partner, Alvord, Burdick and

Howson, Chgo, Illinois
11:30 AM Sewage Disposal
 Samuel A. Greeley, Partner, Greeley and Hansen, Chgo, Illinois

NOON

12:30 PM WSE DINING ROOM
 Luncheon
 Presiding: Dr. Gustav Egloff, Director of Research, Universal Oil Products Co., Chgo, Ill.
 Introduction
 H. P. Sedwick, Executive Vice President, Public Service Co. of Northern Illinois, Chgo, Ill.
 The "Welcome" Sign is Out for Women Engineers
 William V. Kahler, President, Illinois Bell Telephone Co., Chgo, Ill.

AFTERNOON

2:00 PM WSE AUDITORIUM
 Presiding: Mary Ann E. Crawford, BS (Arch), MArch, Chairman, Professional Women's Council, Western Society of Engineers, Chgo, Ill.
2:00 PM Petticoats and Slide Rules
 Margaret Ingels, BME, ME, Engineering Editor, Carrier Corporation, Syracuse, N. Y.
2:30 PM Educating Women for Engineering
 Lois Graham McDowell, BME, MS (ME), Instructor, Asst. to Director, Mechanical Engineering Dept., Illinois Institute of Technology, Chgo, Illinois
3:00 PM Our Untapped Source of Engineering Talent
 Beatrice A. Hicks, BS, MS., Vice President and Chief Engineer, Newark Controls Company, Bloomfield, N. J.
3:30 PM Question Period

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(Continued from Page 7)

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SECTION XI—HEALTH AND HUMAN ENGINEERING—

Thursday, September 11—La Salle Hotel Ballroom

Chairman—Thomas Parran, Dean, Graduate School of Public Health, University of Pittsburgh

Vice-Chairman—Mark D. Hollis, Assistant Surgeon General, Chief Sanitary Engineer Officer, U. S. Public Health Service

Secretary—Theodore F. Hatch, Professor, Industrial Health Engineering, Graduate School of Public Health, University of Pittsburgh

1. Call to order and opening remarks by Chairman
2. Contributions of Engineering to the Advancement of Health

Abel Wolman, Professor, Sanitary Engineering, John Hopkins University, School of Engineering

3. Role of the Sanitary Engineer in Public Health
 Mark D. Hollis, Assistant Surgeon General, Chief Sanitary Engineer Officer, U. S. Public Health Service

4. Present Status of Insect and Rodent Vector Control in Public Health

John A. Logan,
 Division of Medicine and Public Health,
 The Rockefeller Foundation

5. Engineering Control of Man's Physiological Environment

Craig L. Taylor, Professor of Engineering, Department of Engineering, University of California

6. Engineering Considerations in the Man-Machine Relationship

Leonard C. Mead, Research Coordinator, Tufts College

7. The Contribution of Engineering to Optical Hygiene and Vision

Samuel G. Hibben,
 Director of Applied Lighting
 Westinghouse Electric Corporation

8. Commentary

Paul DeKruif, Author

SECTION XII—URBANIZATION—Friday, September 12

—La Salle Ballroom

Chairman—Harland Bartholomew, President
 Harland Bartholomew & Associates

1. The Citizen's Viewpoint—Why People Move Out
 Richard Baumhoff, *St. Louis Post Dispatch*

2. The Viewpoint of the Public Administrator—Problems Created for the Cities and Towns
 L. P. Cookingham, City Manager, Kansas City, Missouri

3. Public Opinion—Importance of an Intelligent Public Relations Program

Fairfax M. Cone, Chairman of the Board, Foote, Cone & Belding

4. The Engineers' Contribution to the Development of the American City

Harold M. Lewis,
 Consulting Engineer & City Planner

(Continued from Page 4)

acres in Chicago, an average of 5.2 acres each. The other firms acquired 4,009 acres of industrial land in suburban and outlying areas, an average of 9.9 acres each.

These 430 industries planned construction of new factory buildings which would have a total of 20,524,200 square feet, or 471 acres of floor space. The average floor area for each industry was 47,731 square feet. Thus it appears that industries which planned to construct new plants acquired on an average of two-tenths of an acre of land for each 1,000 square feet of building planned.

The average size of new buildings constructed or planned by industries of different origins is significant. Newly organized firms planned new buildings having an average of 10,690 square feet of floor space. Branch plants planned averaged 101,707 square feet, industries moving into the area averaged 28,625 square feet and firms relocating within the area averaged 35,220 square

feet of floor space of new construction.

The remaining 565 industries, 56.9 per cent of the 995 total, satisfied their needs for factory space by purchasing or leasing existing factory buildings or space. The floor space thus acquired totalled 23,152,500 square feet, (531 acres) an average of 40,978 square feet if it were evenly divided among the industries.

Net gain to the area through the location of the 684 new and 311 relocated industries is significant.

From an area standpoint the net gain is represented by the 684 new industries, which included 366 newly organized firms, 291 branch plants and 27 firms which moved in from elsewhere. These firms planned to employ 103,490 workers and carry on manufacturing operations in nineteen of the 20 major industry groups established by the United States Department of Commerce.

The annual payroll of these workers represents a substantial contribution to the area and to the communities where the workers live. Based upon the average weekly earnings of \$69.22 for all employees in manufacturing industries in Illinois during October, 1951, the annual payroll of these 103,490 workers would be \$372,564,000. This payroll was new to the area, since none of these industries had previously been operating in the area. It is true, however, that all

the payroll is not additional in the specific community selected by the industry because all employees are not imported. Many are acquired locally, and obviously some of those acquired may already be employed locally or elsewhere.

The 311 industries which relocated within the area do not represent net gain in payroll except to the extent their operations and employment were expanded. However, each such industry represents an addition to the community in which it locates. On the same earning basis applied to the new industries, the 27,210 employees in these relocated firms represent a \$97,965,000 annual payroll which is distributed on a different geographical pattern than before the industries relocated.

The extensive industrial development which took place during these six years involved many real estate transactions and much new building construction. Price of the land acquired for industrial use ranged from \$250 an acre for farm land to \$65,000 or more an acre for city property. No complete data are available about prices paid for the land. However, if an arbitrary price of \$2,000 an acre is applied to the 4,109 acres acquired for normal industrial use, the expenditure would be \$8,218,000.

These same 430 firms planned to construct new factory buildings which would

(Continued on Page 18)

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Engineers' Joint Council Announces Conference

The Engineering Manpower Commission of the Engineers Joint Council announces a conference on Manpower Utilization and National Security to be held at the Conrad Hilton Hotel in Chicago on Sunday, September 7, 1952. The Western Society of Engineers will be the host at this important conference which is being scheduled in conjunction with the Centennial of Engineering celebration commemorating the 100th anniversary of the first professional society of engineers in the United States. General chairman for the session is Ovid W. Eshbach, President of WSE, member of the Engineering Manpower Commis-

sion and Dean of the Northwestern University Technological Institute.

The program is as follows:

MORNING SESSION

9:00 A.M. Registration

10:00 A.M.

Manpower Utilization and National Security—A statement by the Engineering Manpower Commission of Engineers Joint Council presented by Carey H. Brown, chairman of the Engineering Man-

power Commission and manager of Engineering and Manufacturing Services, Eastman Kodak Company.

This statement highlights the position of the Engineering Manpower Commission with respect to such important manpower problems as universal military training, universal military service, expanded R.O.T.C. proposals, unified reserve legislation, selective service, and indus-

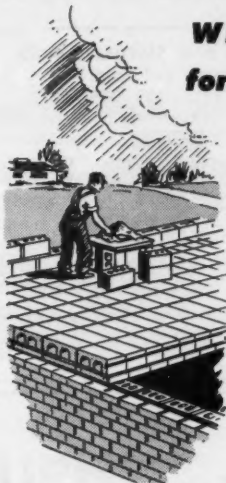
(Continued on Page 16)



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**Papers
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A comprehensive program of ten papers summarizing the status of the industrial applications of atomic energy, each by an expert pre-eminent in his field, will be part of the Seventh National Chemical Exposition in the Chicago Coliseum, Sept. 9 to 13.

The speaking program, set for all day and evening Sept. 11, will be tied in with a special exhibit on atomic industrial devices, presented through the cooperation of the Atomic Energy Commission and the Chicago section of the American Chemical Society, sponsor of the Exposition.

Leading the list of speakers will be Eugene M. Zuckert, member of the Atomic Energy Commission, who will address the evening session on "Atomic Energy and the Citizen of the Future."

The other speakers will be:

10 a.m., S. E. Eaton of Arthur D. Little, Inc., Cambridge, Mass.: "A Sur-

vey of the Industrial Applications of Atomic Energy."

11 a.m., Dr. George G. Manov, Chief of the Advisory Field Service Branch, Isotopes Division, Atomic Energy Commission, Oak Ridge, Tenn.: "Facilities for Tracer Experimentation."

11:30 a.m., Bernard Manowitz, Director of Fission Products Utilization Project at Brookhaven National Laboratory, Upton, N. Y.: "Physical Requirements for the Utilization of Fission Products."

2:15 p.m., Dr. Joseph J. Martin, Associate Professor of Chemical Engineering at the University of Michigan, Ann Arbor, Mich.: "The Use of Radiation to Promote Chemical Reactions."

2:45 p.m., Dr. Charles Rosenblum of the Radiation Laboratory of Merck & Company, Rahway, N. J.: "Design of Tracer Experimentation."

3:15 p.m., Dr. D. M. McCutcheon, director of Physical Sciences at Ford Research Laboratory, Dearborn, Mich.: "The Use of Radiation in Physical Reactions."

3:45 p.m., Dr. Bernard E. Proctor, Head of the Department of Food Technology at the Massachusetts Institute of Technology, Cambridge, Mass.: "Industrial Applications in Biological Reactions."

4:15 p.m., F. J. Lovewell, Assistant Chairman of the Department of Industrial Economics at Stanford Research Institute, Stanford Cal.: "Problems of Business Management in the Atomic Age."

4:45 p.m., J. H. Hayner, Chemical Engineer of the Atomic Energy Commission, Washington, D. C.: "A Look Into the Future."

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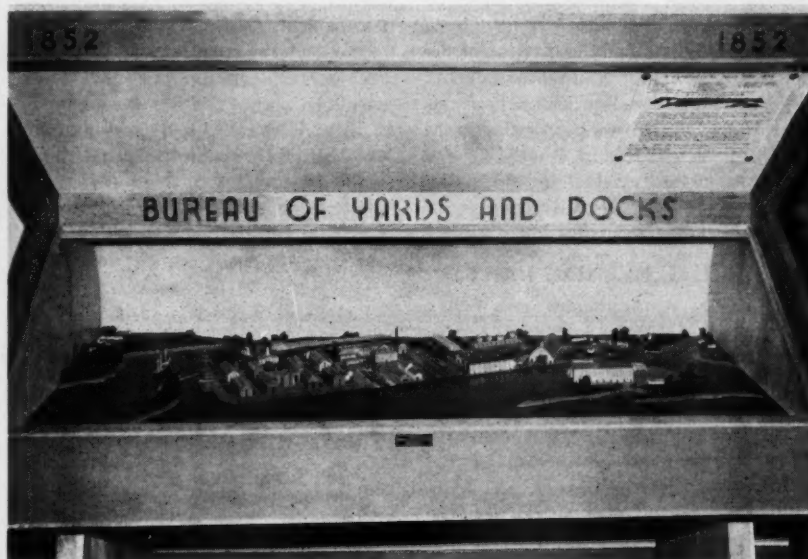
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(Continued from Page 9)

One display shows century-old documents, including plans for some of the Navy's oldest yards. One document, dating back to 1829, shows the original drawings for the Portsmouth, Va., naval shipyard. Many of those buildings are still standing; Navy records show that 87 buildings more than 100 years old and another 289 more than 50 years old are still doing excellent service at those early yards.

Another display illustrates that field of construction in which the CEC gained its greatest fame—the building of advanced bases. The enlisted components of the Corps are called "Construction Battalions"—shortened to "SeaBees." In World War II SeaBees and CEC officers built most of the Navy's advanced bases.

Among the working displays are a mock-up of a Diesel pile hammer captured from the Germans, and a drydock. Both displays may be operated by visitors by a push button.



A NAVY YARD OF 1852 is one of eleven exhibits by the Navy's Civil Engineering Corps on display at the Museum of Science and Industry, Chicago. The model shows how a Navy yard, rigged for the construction and repair of wooden sailing ships, would have looked in 1852. A companion model shows how a yard at the same location would look today. The exhibit is a part of Chicago's Centennial of Engineering observance. (U. S. Navy photo).

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Program for Convocation

Inasmuch as the printed Convocation Program for the Centennial of Engineering will not be available in advance of the Convocation, the program for Centennial Day, September 10 is given below.

CENTENNIAL DAY LUNCHEON

Conrad Hilton Hotel Ballroom
12:30 P.M.
Tickets—\$5.00

Invocation

Greeting to the Convocation—Mayor Martin H. Kennelly, Chicago.

Greetings to ASCE on behalf of the profession—Allan S. Quartermaine, President, British Institution of Civil Engineers.

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Response—Carlton S. Proctor, President, ASCE.

Award of The John Fritz Medal to Mr. Benjamin Franklin Fairless, President, United States Steel Corporation with appropriate ceremonies including an address by Mr. Fairless.

Award of The Hoover Medal to the Rt. Hon. Clarence Decatur Howe, Minister of Trade and Commerce and Defense Production, Canadian Government, with appropriate ceremonies and an address by Mr. Howe.

Already, many scrolls carrying greetings to ASCE from other societies in honor of its 100th anniversary have been received. All will be on exhibition at the Conrad Hilton Hotel. In view of the large number it has not been considered feasible to arrange for personal presentation of each scroll. As noted in the above program, President Quartermaine has been invited to extend greetings on behalf of the entire profession.

CENTENNIAL EVENING PARTY

International Amphitheater
7:00 P.M.
Tickets—\$11.00

Dinner will be served in the second-story wing of the International Amphitheater. After dinner, the guests will move into a reserved section of the Arena where Mr. Charles F. Kettering will deliver an address on the subject, "A Review of the Century."

Following this address there will be a special performance of the Sonja Henie 1953 Ice Review. This is an entirely new production. Originally scheduled to open on September 11, this special showing has been arranged in recognition of the significance of the Convocation.

(Continued from Page 13)

trial utilization of specialized personnel in short supply.

Discussors of these problems will be: Dr. Arthur S. Adams, president of the American Council on Education; Hon. William C. Foster, Deputy Secretary of Defense; Gen. Lewis B. Hershey, Director of Selective Service; Mr. George A. Jacoby, Director of Personnel Services Section of General Motors Corp.; Dr. Harry S. Rogers, chairman of Engineers Council for Professional Development; Mr. Henry J. Taylor, noted economist, journalist and radio commentator and Mr. J. E. Trainer, Vice President of Firestone Tire & Rubber Co.

12.30 LUNCHEON

Normandie Lounge, Conrad Hilton Hotel

Provisions have been made for those attending the Manpower Conference to have lunch together. There will be no speaker. Tickets may be obtained from J. Earl Harrington, executive secretary, Western Society of Engineers, 84 E. Randolph Street, Chicago 1, at \$4.00 a person.

12:00 P.M. OPEN FORUM

Those attending will have an opportunity to submit questions to a panel composed of the following: Arthur S. Adams, Carey H. Brown, O. W. Eshbach, William C. Foster, Lewis B. Hershey, A. C. Monteith, Harry S. Rogers, Henry J. Taylor and J. E. Trainer.

4:00 P.M. SUMMARY

A. C. Monteith, vice president of the Westinghouse Electric Corporation will preside.

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Men, Materials, and the Power Industry to be subject of lecture

An interesting lecture by Norman L. Mochel, Vice-President of ASTM, and Manager, Metallurgical Engineering, Westinghouse Electric Corp., on the Subject "Men, Materials, and the Power Industry—A Trio in Action" and a session on "Wood," part of Symposium on "100 Years of Engineering Progress With Wood" are to feature sessions sponsored by the American Society for Testing Materials on September 10 and 11 at the Hotel Sherman in Chicago during the Centennial of Engineering.

Mr. Mochel will trace some of the remarkable growth of the prime movers which have made possible our great central stations of today, and note some of the technical and materials problems that have been met. In this work the

materials engineer and his related scientific associates have made innumerable contributions. Mr. Mochel has been intimately concerned with many of the developments for many years not only in the work with his company, where he has cooperated closely with the many branches of the Government and particularly the United States Navy and the National Advisory Committee on Aeronautics, but also in his capacity for many years as Chairman of ASTM Committee A-1 on Steel and the joint ASTM-ASME Committee on Effect of Temperature. ASTM Past-President Harold H. Morgan, Vice-President and Chief Engineer, Robert W. Hunt Co., will preside at this session, scheduled for 10 A.M. September 10.

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Crerar Library Notes and News

The John Crerar Library now has in press a detailed statement of its entire acquisition policy in the fields of science, technology, and medicine. Copies of the complete statement will be ready shortly and will be available to interested persons on request.

This statement defines the extent to which each subject field will be covered in the Library's collections. The most important categories of collection are the following:

1) *A Reference Collection.* This is a collection adequate to determine only in broad outline the current status of knowledge on a subject.

2) *A Research Collection.* This is a collection adequate for the needs of specialists in the field and includes the major portion of material required for independent research.

3) *A Comprehensive Collection.* This

is a Research Collection plus a wider selection of foreign language material as well as the most important works for historical research in the field.

The policy statement indicates that the following fields will be maintained at the level of a comprehensive collection: Engineering Mechanics and Materials, Mechanical Engineering, Electrical Engineering, Refrigeration Engineering, Mining Engineering, Marine Engineering (except building), Structural Engineering, Railroad and Highway Engineering, Hydraulic Engineering, Sanitary Engineering, Aeronautical Engineering, Automotive Engineering, Chemical Engineering (including food technology, metallurgy, petroleum technology, and ceramics), and Building Construction.

A reference collection only will be maintained in the fields of Military Engineering and Shipbuilding.

Comprehensive collections will also be maintained in the following fields of related interest to engineers: Applied Mathematics, Geodesy, Pure Physics, and Pure Chemistry.

This detailed policy on depth of coverage, which clearly indicates those subjects excluded from the Library's collections (in general the humanities and social sciences are out of scope) as well as those to be emphasized, makes it possible to build the collections for maximum effectiveness and without waste for better service to the scientific and technical research of the Midwest. Under this policy, The John Crerar Library will continue as the largest and most complete library in the United States devoted exclusively to science, technology, and medicine.

(Continued from Page 12)

contain 20,524,200 square feet of floor space. Again, no exact data about cost of these buildings is available, but if a conservative cost figure of \$5.00 a square foot of floor space is assumed for the years 1945-1950 inclusive, the expenditure for new factory buildings would be in the neighborhood of \$102,621,000.

Most of the communities throughout the Chicago and Northern Illinois area appeared to have obtained new or relocated industries in proportion to their general relationship to the market advantages, labor supply, transportation service and other economic facilities in the area as a whole. It is evident that conditions throughout the entire Northern Illinois area are generally favorable to industry.

The trend of industry has been toward suburban and outlying areas, but to an extent this movement has been offset by the growth and expansion of firms which have roots deep in Chicago and must utilize the advantages of a city location.

Chicago and Northern Illinois is one of the world's most favored regions for industrial progress. Its geographical location, its productive soil, its excellent health conditions, its abundance of raw materials, its unequalled transportation facilities, and its proximity to the fuels and ores, the herds and granaries of the Great Lakes-Mississippi Valley Basin—all these are its natural heritage. The area is enjoying industrial growth through new and relocated industries at a rate which will not only maintain but enhance its position of prestige and leadership.

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These items are from information furnished by the Engineering Societies Personnel Service, Inc., Chicago. This SERVICE, operated on a co-operative, non-profit basis, is sponsored by the Western Society of Engineers and the national societies of Civil, Electrical, Mechanical and Mining and Metallurgical Engineers. Apply to ESPS, Chicago and the key number indicated. Prepared ENGINEERS AVAILABLE advertisements limited to 40 words, with typed resume attached may be submitted to ESPS Chicago by members of Western Society of Engineers at no charge.

OVER THE MANAGER'S DESK

Labor Day is generally considered the end of vacations and the beginning of a work period for the Fall. It is a good time to review your needs for engineering help or an engineering position. Employers will find men are interested in changing positions in the Fall in a number of cases so they can build up the vacation time for next year. Engineers will find opportunities opening up to get new men to help complete engineering programs for this year and to start new ones for next year.

Either as an employer who needs help, or as an engineer who wants to better himself, contact E.S.P.S. and let us go to work on your problem. B.H.A.

POSITIONS AVAILABLE

R-9113 RECENT GRAD. Arch or Structural training. Degree not necessary. Recent grad or better. Knowledge of architectural drawings. Duties: take off light structural steel and metal work on construction projects, estimate quantities and costs, and some occasional drafting. For Mfr. of steel frames. Salary: \$75-\$80 week. Loc. Chicago. Employer will negotiate the fee.

R-9114 SALES PLASTICS. Age: Up to 35. 2 plus yrs. exp. in industrial sales. Familiar with domestic appliance mfrs. Duties: contacting mfr. in Chgo., Wisc., and Minnesota who make products out of injection molded plastics. For a Mfr. of Plastics. Salary: \$5500-\$6500 yr. Location: Chicago. Employer may negotiate the fee. Travel 33%. Car is not required.

T-9115 INSTRUCTOR. to teach mechanism, engineering problems, engrg. drawing and descriptive geometry. It would be helpful if individual could also teach surveying. The teaching load is about one-half for the academic year. For the remainder of the half time the school would like to have someone who could teach in their new vocational tech. dept. in such a field as electrical technicians work or radio. Salary: \$3800-\$4200 for 9 mos. Location: Northwest.

T-9116(b) SALES ENGR. EE Degree. Age: 25-40. 5 yrs. exp. electrical engrg. Would prefer motor design exp. but may accept other electrical design exp. Know: sales technique, supervision of people. Duties: to supervise Sales Office of 5 or 6 inside people and spend 2 or 3 days a

week calling on key accounts in the Midwest. For Electrical Mfg. of Elec. Motors. Salary: to \$6000. Loc. Iowa. Employer will pay fee. Some travel.

T-9116(a) DESIGN ENGINEER EE degree. Age: 25-40. 5 yrs. exp. Electrical Engrg. Would prefer motor design exp. but may accept other electrical design exp. Duties: Electrical design of d-c machines $\frac{1}{2}$ hp to 200 hp. Some customer contact and quality control supervision of units going through the shop. For an Electrical Mfg. of Elec. Motors. Salary \$7200 to \$9000. Location N.J. or Iowa.

R-9117 CHIEF TOOL DESIGNER. Should be capable of recommending best methods of manufacture. Practical background of tool room experience preferred. Must have actual supervision experience. Duties: Supervising tool engineers in the design of all types of dies, tools, jigs and fixtures. Salary: \$7-8000 Loc.: Chicago.

R-9106(a) DESIGNER—PLANT ENGINEER Age: to 45 5 yrs. exp. Knowledge of wood and metal products. Duties: product designing on pianos and organs. Combination of designing and overseeing all plant maintenance. Salary to \$10,000. Employer will pay the fee. Location: Chicago.

R-9106(b) TIME STUDY ENGINEER Age 25 plus. 2 yrs. exp. required on time study. Duties: Methods, time study, studying operations and setting rates for manufacturer of musical instruments. Salary: to \$95 per week. Company will pay the fee. Location: Chicago.

If placed in a position as a result of an Engineers Available or Position Available advertisement, applicants agree to pay the established placement fee. These rates are available on request and are sufficient to maintain an effective non-profit personnel service. A weekly bulletin of positions open is available to subscribers. Apply ESPS Chicago.

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DEVELOPMENT ENGR. EE 30. Twenty seven mos. Electrical Test doing testing and analyzing defects in electronic solovox, and correction of these defects. One yr. testing and adjustment of automatic heat control units. \$3900 Chicago 407 MW.

PRODUCTION ENGR. ME 30. Seventeen mos. Aerial Navigator. Three mos. Supervisory Trainee learning to operate & set up production machinery used to thread bolt blanks with a small amount of time study. Three mos. inspect and test structural steel, rails, wheels, axles, and concrete. Seven mos. inspect and gauge screw machine products. \$4500 Chicago 408 MW.

MASTER MECHANIC 44. One yr. and three mos. General Foreman in charge of mechanical work, responsible for the solution of specific problems. Twenty mos. Instrument Maker, making all kinds of laboratory equipment and drafting. Nine mos. building automatic sponge making machines. \$7000 Chicago 409 MW.

PROCESS ENG. ME 25. Eleven mos. Product Eng., developing designs, engineer for the mfg. of new & changed products and order all facilities for these products. Nine mos. Tool Designer, designing jigs, fixtures, perishable tools and gages. Five mos. doing sand research, pattern design and making, development concerning scrap control. \$5600 Midwest 410 MW.

PROD. DEV. ENGR. EE 26. One yr. and one half testing commercial cooking equipment for operating characteristics and compliance with underwriters requirements. \$5000 Chicago 411 MW.

SALES ENG. 28. One yr. and one half contacting the engineering staffs of industrial firms in connection with an engineering service, service and treating pressure castings metal and non-metallic castings. Three yrs. Radar and radio maintenance & operations. \$85 per week. Chicago 413 MW.

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... in the Chicago Area

In the Chicago area, education works with industry to coordinate classroom theory with actual industrial practice. The advantages which result—for industrial firms and their employes—are great.

Several educational institutions in the Chicago area, in cooperation with various industrial firms, have developed cooperative training programs for students in certain engineering curricula. Students who elect these courses alternate three-month periods of university study with similar periods of industrial work with cooperating industries. The combination of formal schooling and on-the-job training turns out men who keenly appreciate both the practical necessities of industry and the theoretical principles which underlie them.

Two major factors promote the success of cooperative training programs in the Chicago area. First, the region is the industrial heartland of the nation; it contains an abundance of diversified industries. Second, the area is richly endowed with a variety of high-calibre educational facilities.

The results have been valuable to the participating industries, to the students enrolled in the training programs, and to the cooperating educational institutions.

Industry gains highly trained personnel, and has the opportunity to select for permanent, responsible jobs the best prospects in the group being trained. Since the cooperative programs attract alert, well-balanced individuals, the quality of the entire group is high.

The *students* profit from their knowledge of actual working conditions. They are better able to absorb and weigh the classroom instruction they receive.

The *educational institutions* can plan courses that will fit the needs of the students. Close contact with industry permits adjustment of courses to meet new industrial conditions.

Cooperative training programs are only one way in which education and industry work together in Chicago and Northern Illinois. The combination of a great educational center with a great industrial area offers unusual benefits to every industrialist.

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